

What is claimed is:

1. A set top box for an interactive television system, the set top box configured  
5 to provide two-way communication using the interactive television system between a  
near-end user and a far-end user, the set top box comprising:

a processor;

a wireless receiver coupled to the processor for communicating with a remote  
control;

10 an interface coupled to the processor for communicating with the far-end  
user;

a noise cancellation module coupled to the wireless receiver and to the  
interface and having:

a first input to receive TV audio output;

15 a second input coupled to the receiver to receive input sound; and

an adaptive filter to remove the TV audio output from the input sound  
based on an estimate of received TV audio output; and

a memory coupled to the processor, the memory including:

communication instructions for establishing two-way communication  
20 with the far-end user via the interactive television system.

2. The set top box of claim 1, wherein the adaptive filter comprises adaptive filter  
program code resident in the memory.

3. The set top box of claim 1, wherein the adaptive filter comprises a digital signal processor coupled to the wireless receiver and to the interface with adaptive filter instructions.

5 4. The set top box of claim 1, wherein the adaptive filter comprises analog components coupled to the wireless receiver and to the interface.

5. The set top box of claim 1, wherein the set top box further comprises a microphone configured to capture the input sound.

10 6. The set top box of claim 1, wherein the set top box is coupled to an output device for generating audible output.

15 7. The set top box of claim 1 further comprising a training module coupled to the noise cancellation module and to the wireless receiver for training the adaptive filter to improve the estimate of received TV audio output.

20 8. A set top box for an interactive television system, the set top box configured to provide two-way communication using the interactive television system between a near-end user and a far-end user, the set top box comprising:

a processor;

a wireless receiver coupled to the processor for communicating with a remote control;

an interface coupled to the processor for communicating with the far-end user;

an output suppression module coupled to the wireless receiver and to a TV audio output, the output suppression module having:

- 5           a first input coupled to the receiver to receive input sound;
- a first output coupled to the TV audio output; and
- a near-end audio detector to detect near-end audio in the input sound and to suppress the TV audio output when the near-end audio is detected;
- a memory coupled to the processor, the memory including:
  - 10           communication instructions for establishing two-way communication with the far-end user via the interactive television system.

9.    The set top box of claim 8, wherein the near-end audio detector comprises detecting code resident in the memory for detecting near-end audio in the input  
15    sound.

10.   The set top box of claim 8, wherein the output suppression module comprises a digital signal processor coupled to the wireless receiver and to the TV audio output and having suppression instructions.

11.   The set top box of claim 8, wherein the output suppression module comprises analog components coupled to the wireless receiver and to the TV audio output.

12. The set top box of claim 8, wherein the set top box further comprises a microphone configured to capture the input sound.

13. The set top box of claim 8, wherein the set top box is coupled to an output  
5 device for generating audible output.

14. The set top box of claim 8, further comprising a training module coupled to the output suppression module and to the wireless receiver for training the output suppression module.

15. A system for providing two-way communication using an interactive television system, the system comprising:

a remote control configured to control operation of the interactive television system, the remote control further comprising a wireless transmitter configured to  
15 communicate with the interactive television system; and

a set top box configured to establish two-way communication with a far-end user via the interactive television system, the set top box comprising:

a processor;

a wireless receiver coupled to the processor for receiving  
20 transmissions from the wireless transmitter;

an interface coupled to the processor for communicating with the far-end user;

a noise cancellation module coupled to the wireless receiver and to the interface and having:

a first input to receive TV audio output;

a second input coupled to the receiver to receive input sound;

5 and

an adaptive filter to remove the TV audio output from the input sound based on an estimate of received TV audio output;

a memory coupled to the processor, the memory including:

communication instructions for establishing two-way  
10 communication with the far-end user via the interactive television system.

16. The system of claim 15, wherein the adaptive filter comprises adaptive filter program code resident in the memory.

15 17. The system of claim 15, wherein the adaptive filter comprises a digital signal processor coupled to the wireless receiver and to the interface with adaptive filter instructions.

20 18. The system of claim 15, wherein the adaptive filter comprises analog components coupled to the wireless receiver and to the interface.

19. The system of claim 15, wherein the set top box further comprises a microphone configured to capture the input sound.

20. The system of claim 15, wherein the set top box is coupled to an output  
5 device for generating audible output.

21. The system of claim 15, wherein the set top box further comprises a training module coupled to the noise cancellation module and to the wireless receiver for training the adaptive filter to improve the estimate of received TV audio output.

22. The system of claim 15, wherein the remote control further comprises:  
a microphone configured to capture the input sound for transmission to the  
set top box via the wireless transmitter;

a remote control wireless receiver configured to receive a far-end audio  
15 signal; and

a remote control speaker configured to generate far-end audible output from  
the far-end audio signal.

23. The system of claim 22, wherein the remote control speaker and the  
20 microphone are further configured to operate simultaneously to provide two-way audio communication with the far-end user via the interactive television system.

24. The system of claim 23, wherein the system further comprises a second speaker for generating television sound.

25. The system of claim 24, wherein the set top box comprises a broadband communication component configured to initiate communication with the far-end user via a second interactive television system.

26. The system of claim 24, wherein the set top box comprises an Internet communication component configured to initiate communication with the far-end user via the Internet.

27. The system of claim 24, wherein the set top box comprises a telephone network component configured to initiate communication with the far-end user via a telephone network.

28. A system for providing two-way communication using an interactive television system, the system comprising:

a remote control configured to control operation of the interactive television system, the remote control further comprising a wireless transmitter configured to communicate with the interactive television system; and

a set top box configured to establish two-way communication with a far-end user via the interactive television system, the set top box comprising:

a processor;

a wireless receiver coupled to the processor for receiving transmissions from the wireless transmitter;

an interface coupled to the processor for communicating with the far-end user;

5 an output suppression module coupled to the wireless receiver and to a TV audio output, the output suppression module having:

a first input coupled to the receiver to receive input sound;

a first output coupled to the TV audio output; and

10 a near-end audio detector to detect near-end audio in the input sound and to suppress the TV audio output when the near-end audio is detected;

a memory coupled to the processor, the memory including:

15 communication instructions for establishing two-way communication with the far-end user via the interactive television system.

29. The system of claim 28, wherein the near-end audio detector comprises detecting code resident in the memory for detecting near-end audio in the input sound.

20 30. The system of claim 28, wherein the output suppression module comprises a digital signal processor coupled to the wireless receiver and to the TV audio output and having suppression instructions.



31. The system of claim 28, wherein the output suppression module comprises analog components coupled to the wireless receiver and to the TV audio output.

32. The system of claim 28, wherein the set top box further comprises a  
5 microphone configured to capture the input sound.

33. The system of claim 28, wherein the set top box is coupled to an output device for generating audible output.

10 34. The system of claim 28, wherein the set top box further comprises a training module coupled to the output suppression module and to the wireless receiver for training the output suppression module.

15 35. The system of claim 28, wherein the remote control further comprises:  
a microphone configured to capture the input sound for transmission to the set top box via the wireless transmitter;

a remote control wireless receiver configured to receive a far-end audio signal; and

20 a remote control speaker configured to generate far-end audible output from the far-end audio signal.

36. The system of claim 35, wherein the remote control speaker and the microphone are further configured to operate simultaneously to provide two-way audio communication with the far-end user via the interactive television system.

5 37. The system of claim 36, wherein the system further comprises a second speaker for generating television sound.

10 38. The system of claim 37, wherein the set top box comprises a broadband communication component configured to initiate communication with the far-end user via a second interactive television system.

15 39. The system of claim 37, wherein the set top box comprises an Internet communication component configured to initiate communication with the far-end user via the Internet.

40. The system of claim 37, wherein the set top box comprises a telephone network component configured to initiate communication with the far-end user via a telephone network.

20 41. A method of providing two-way communication over an interactive television system, the method comprising:

outputting television sound to a speaker;

capturing a first audio signal through use of a microphone integrated with a remote control, the first audio signal including the television sound;

transmitting the first audio signal from a wireless transmitter of the remote control to a wireless receiver of a set top box;

5 canceling the television sound from the first audio signal to generate a filtered first audio signal; and

transmitting the filtered first audio signal to a far-end user via the interactive television system.

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42. The method of claim 41, further comprising:

transmitting a second audio signal to the remote control to generate audible output of a far-end user to provide two-way communication via the interactive television system through the remote control.

15 43. The method of claim 42, wherein the television sound is canceled through use of a noise cancellation module.

44. The method of claim 43, wherein the noise cancellation module includes an adaptive filter for canceling the television sound.

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45. The method of claim 44, wherein canceling the television sound comprises:

estimating the television sound to produce a television sound estimate; and  
subtracting the television sound estimate from the first audio signal to  
generate the filtered first audio signal.

5 46. The method of claim 45, further comprising training the adaptive filter.

47. A method of providing two-way communication over an interactive television  
system, the method comprising:

capturing audio through use of a microphone integrated with a remote control;  
10 transmitting the audio from a wireless transmitter of the remote control to a  
wireless receiver of a set top box;

detecting when a first audio signal is present in the audio;

suppressing television sound when the first audio signal is detected;

outputting the television sound when the first audio signal is not detected; and

15 transmitting the first audio signal to a far-end user via the interactive television  
system.

48. The method of claim 47, further comprising:

transmitting a second audio signal to the remote control to generate audible

20 output of a far-end user to provide two-way communication via the interactive  
television system through the remote control.

49. The method of claim 48, wherein the television sound is suppressed through use of an output suppression module.

5 50. The method of claim 49, further comprising training the output suppression module.

51. A set top box for an interactive television system, the set top box being configured to provide two-way communication using the interactive television system  
10 between a near-end user and a far-end user, the set top box comprising:

an interface for communicating with the far-end user;

an audio coupling to the interactive television system for providing the television sound to the interactive television system for outputting the television sound to the near-end user;

15 a wireless receiver for communicating with a remote control and for receiving a first audio signal from the remote control, the first audio signal including near-end user speech and television sound;

an analog-to-digital converter coupled to the wireless receiver for converting the first audio signal to a digital first audio signal;

20 a processor coupled to the analog-to-digital converter for processing the digital first audio signal;

a memory coupled to the processor, the memory including:

communication instructions for establishing two-way communication with the far-end user via the interactive television system;

a noise cancellation module for canceling the television sound from the digital first audio signal, the noise cancellation module comprising noise cancellation instructions executable by the processor; and

a bus enabling electronic communication between the processor and the memory.

52. A set top box for an interactive television system, the set top box being configured to provide two-way communication using the interactive television system between a near-end user and a far-end user, the set top box comprising:

an interface for communicating with the far-end user;

an audio coupling to the interactive television system for providing the television sound to the interactive television system for outputting the television sound to the near-end user;

a wireless receiver for communicating with a remote control and for receiving a first audio signal from the remote control;

an analog-to-digital converter coupled to the wireless receiver for converting the first audio signal to a digital first audio signal;

a processor coupled to the analog-to-digital converter for processing the digital first audio signal;

a memory coupled to the processor, the memory including:

communication instructions for establishing two-way communication with the far-end user via the interactive television system;

an output suppression module for detecting audio user input in the first audio signal and to suppress the television sound when the audio user input is detected, the output suppression module comprising output suppression instructions executable by the processor; and

a bus enabling electronic communication between the processor and the memory.

53. A method of providing two-way communication over an interactive television system, the method comprising:

receiving a television signal that includes a television audio signal;

providing the television audio signal to the interactive television system;

outputting the television audio signal to a speaker to produce television sound;

capturing a first audio signal through use of a microphone integrated with a remote control;

transmitting the first audio signal from a wireless transmitter of a remote control to a wireless receiver of a set top box;

converting the first audio signal to a digital first audio signal;

canceling the television sound from the digital first audio signal to generate a filtered first audio signal;

generating a data stream that includes the filtered first audio signal; and

transmitting the data stream to a far-end user via the interactive television system.

54. A method of providing two-way communication over an interactive television system, the method comprising:

receiving a television signal that includes a television audio signal;

providing the television audio signal to the interactive television system;

outputting the television audio signal to a speaker to produce television sound;

capturing audio through use of a microphone integrated with a remote control;  
transmitting the audio from a wireless transmitter of the remote control to a wireless receiver of a set top box;

converting the audio to a digital audio signal;

detecting when a first audio signal is present in the digital audio signal;

suppressing television sound when the first audio signal is detected;  
outputting the television audio signal to the speaker when the first audio signal is not detected; and

transmitting the first audio signal to a far-end user via the interactive television system.

55. A system for providing two-way communication using an interactive television system between a near-end user and a far-end user, the system comprising:



a remote control configured to control operation of the interactive television system, the remote control comprising a wireless transmitter configured to communicate with the interactive television system and a microphone configured to capture a first audio signal for transmission to the set top box via the wireless transmitter; and

a set top box, the set top box comprising:

an interface for communicating with the far-end user;

an audio coupling to the interactive television system for providing television sound to the interactive television system for outputting the television sound to the near-end user;

a wireless receiver for communicating with the remote control and for receiving the first audio signal from the remote control, the first audio signal including near-end user speech and television sound;

an analog-to-digital converter coupled to the wireless receiver for converting the first audio signal to a digital first audio signal;

a processor coupled to the analog-to-digital converter for processing the digital first audio signal;

a memory coupled to the processor, the memory including:

communication instructions for establishing two-way communication with the far-end user via the interactive television system;

a noise cancellation module for canceling the television sound from the digital first audio signal, the noise cancellation module

comprising noise cancellation instructions executable by the processor;  
and

a bus enabling electronic communication between the processor and  
the memory;

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56. A system for providing two-way communication using an interactive television  
system between a near-end user and a far-end user, the system comprising:

a remote control configured to control operation of the interactive television  
system, the remote control comprising a wireless transmitter configured to  
10 communicate with the interactive television system and a microphone configured to  
capture a first audio signal for transmission to the set top box via the wireless  
transmitter; and

a set top box, the set top box comprising:

an interface for communicating with the far-end user;

15 an audio coupling to the interactive television system for providing the  
television sound to the interactive television system for outputting the  
television sound to the near-end user;

a wireless receiver for communicating with the remote control and for  
receiving a first audio signal from the remote control;

20 an analog-to-digital converter coupled to the wireless receiver for  
converting the first audio signal to a digital first audio signal;

a processor coupled to the analog-to-digital converter for processing  
the digital first audio signal;

a memory coupled to the processor, the memory including:

communication instructions for establishing two-way communication with the far-end user via the interactive television system;

5 an output suppression module for detecting audio user input in the first audio signal and to suppress the television sound when the audio user input is detected, the output suppression module comprising output suppression instructions executable by the processor; and

10 a bus enabling electronic communication between the processor and the memory.

57. A set top box for an interactive television system, the set top box configured to provide two-way communication using the interactive television system between a  
15 near-end user and a far-end user, the set top box comprising:

processing means;

wireless receiving means coupled to the processing means for communicating with a remote control;

20 interface means coupled to the processing means for communicating with the far-end user;

noise cancellation means coupled to the wireless receiving means and to the interface means and having:

first input means for receiving TV audio output;

second input means coupled to the wireless receiving means for receiving input sound; and

adaptive filtering means for removing the TV audio output from the input sound based on an estimate of received TV audio output; and

5 memory means coupled to the processing means, the memory means including communication instructions for establishing two-way communication with the far-end user via the interactive television system.

58. A system for providing two-way communication using an interactive television system, the system comprising:

control means for remotely controlling operation of the interactive television system, the remote control means further comprising wireless transmission means configured to communicate with the interactive television system; and

communication means for establishing two-way communication with a far-end user via the interactive television system, the communication means comprising:

processing means;

wireless receiving means coupled to the processing means for receiving transmissions from the wireless transmission means;

interface means coupled to the processing means for communicating with the far-end user;

noise cancellation means coupled to the wireless receiving means and to the interface means and having:

first input means for receiving TV audio output;

second input means for receiving input sound; and

adaptive filter means for removing the TV audio output from the

input sound based on an estimate of received TV audio output; and

memory means coupled to the processing means, the memory means

5 including communication instructions for establishing two-way communication  
with the far-end user via the interactive television system.

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